Table 3-3. Status of State or Federally Listed Endangered and Threatened Plants that May Occur at BV-2C Proposed Dredged Material Disposal Site, Brevard County, Florida (Page 2 of 2)

Species	Status		
	State	FCREPA	Federal
Thelypteris palustris Aspidium fern	T		
Tillandsia fasiculata Common wild pine	T		
Tillandsia utriculata Common wild pine	T		
Vittaria lineata Shoestring fern	T		
Woodwardia aerolata Netted chain fern	T		
Zephyranthes spp. Rain lilies	T		
Zephranthes simpsonii Simpson zephyr lily	E		

* confirmed on site

State: Florida Department of Agriculture; T = Threatened; C = Commercially exploited.

FCREPA: Florida Committee on Rare and Endangered Plants and Animals (unofficial).

Federal: U.S. Fish and Wildlife Service.

Source: WAR 1991.

growing in a transitional area of the mixed hardwood/wetland hardwood forest (438/610). A variety of other listed ferns many also grow in these communities. Only the hand fern would be considered a notable occurrence. These ferns which grow epiphytically on cabbage palm were not observed in the locales visited.

Two species of orchids, listed as state threatened, were observed in the study area. A number of rein orchids were observed within the mixed hardwood/wetland hardwood forest (438/610). Also within the same community was the greenfly orchid, growing epiphytically on the limbs of hardwoods. The greenfly orchid was also observed on live oaks within the temperate hardwood community (425).

In the herbaceous rangeland (310) and along shallow ditches, suitable habitat is available for rain lilies. These are conspicuous plants when blooming in the spring.

4.0 WILDLIFE COMMUNITIES

4.0 WILDLIFE COMMUNITIES

Table 4-1 lists species of wildlife observed during field surveys and identifies habitats in which they were observed. Wildlife habitats on the site include citrus grove (221), fallow cropland (261), temperate hardwood (425), mixed hardwood/wetland hardwood (438/610) and a variety of non-forested wetlands.

4.1 WILDLIFE HABITATS

The citrus grove and fallow cropland which cover the majority of the site offer only limited wildlife habitat. In these areas, there is little cover or forage and, therefore, resident wildlife is scarce. In citrus groves little leaf litter builds up under the trees reducing possible habitat for small reptiles or mammals. Sprays used in conjunction with citrus management often reduce insect populations and forage for insect eating birds. Most wildlife in well-managed citrus groves are found along the margins of the grove.

Birds that may be found in citrus groves are species typical of open land including Mourning and Ground dove, Meadowlark, Mockingbird, Cardinal, and Blue jay. Birds of prey will sometimes perch in larger trees nearby or forage over open groves. Small rodents such as mice or rats may utilize brush piles or windrows bordering citrus areas, providing forage for hawks or owls.

Groves may provide some habitat for a few species of reptiles such as ground skinks, six-lined race runner, southern fence lizard, green anole and southern black racer. Few amphibians typically inhabit citrus groves but ponds or ditches which occur throughout the grove provide habitat and breeding areas for frogs. Southern leopard frogs were occasionally observed along ditches.

The upland forests on the site are somewhat disturbed but they provide moderately good cover and food resources. Since the temperate hardwood forest is adjacent to the more extensive mixed hardwood/wetland hardwood community, it is more beneficial to wildlife than if it were completely isolated by agricultural land. The mixed hardwood/wetland hardwood forest area had a variety of food resources that would be utilized by wildlife. A variety of

Table 4-1. Vertebrates Observed at BV-2C Proposed Dredged Material Disposal Area, Brevard County, Florida

Scientific Name	Common Name	Vegetation Community*
REPTILES AND AMPHIBIANS		
Anolis carolinensis	Green anole	438/610
Bufo terrestris	Southern toad	438/610
Hyla cinera	Green tree frog	438/610,641, 641/642
Opheodrys aestivus	Rough green snake	438/610
Rana shenocephala	Southern leopard frog	510,425, 438/610
BIRDS		
Ardea herodias	Great blue heron	618/642
Buteo jamaicensis	Red-tailed hawk	221/425
Butorides striatus	Green heron	618/642,641
Cardinalis cardinalis	Northern cardinal	425
Casmerodius albus	Great egret	618/642,642
Ceryle alcyon	Belted kingfisher	425,618/642, 642
Columbina passerina	Ground dove	425
Egretta thula	Snowy egret	642
Hydranassa tricolor	Tri-colored heron	642
Melanerpes carolinus	Red-bellied woodpecker	425
Mycteria americana	Woodstork	642
Phalacrocorax auritus	Double-crested cormorant	642
Seiurus aurocapillus	Ovenbird	438/610
Thryothorus ludovicianus	Carolina wren	425
Zenaida macroura	Mourning dove	261,425
MAMMALS		
Dasypus novemcinctus	Armadillo	425
Procyon lotor	Raccoon	641/642
Sylvilagus floridanus	Eastern cottontail	261

Note: 261 = Fallow Cropland; 425 = Temperate Hardwood; 438/610 = Mixed Hardwood Forest/Wetland Hardwood; 510 = Streams and Waterways; 618/642 = Shrub Marsh/Saltwater Marsh; 641 = Freshwater Marsh; 641/642 = Freshwater Marsh/Saltwater Marsh; 642 = Saltwater Marsh.

Source: WAR 1991.

small mammals as well as larger mammals such as opossum, raccoon, bobcat, and armadillo may be found in this forest. Because of the presence of both upland and wetland species, the diversity of animals utilizing this area is probably high. Reptiles frequenting such areas typically include black racer, rough green snake, yellow rat snakes, diamondback rattlesnake, eastern box turtle, stinkpots, broadheaded skinks, and ground skinks. Canopy-dwelling birds such as woodpeckers, warblers, and other passerines are commonly associated with hardwood forests. These areas may be particularly important to warblers that migrate down the Atlantic flyway and use coastal forested areas to rest and feed.

The marshes provide important habitat for coastal and wading birds. Food resources are particularly abundant. Freshwater marshes harbor frogs, insects and a variety of invertebrates that are used as food. Brackish and saltwater marshes provide small fish, worms, clams, snails, and crabs which attract a variety birdlife.

4.2 THREATENED AND ENDANGERED WILDLIFE

Table 4-2 compiles possible and observed listed wildlife species for BV-2C. Two listed wading birds were observed on BV-2C although the potential for others species using the site is high quite high. A Snowy egret and a Tri-colored heron, state listed as species of special concern, were observed foraging brackish marshes along eastern side of the property.

Most of the species compiled in Table 4-2 are listed wildlife that would use the Indian River or adjacent emergent wetlands. It has been documented that sea turtles, predominantly loggerheads and green sea turtles use the Indian River lagoon as developmental habitat in the early postpelagic years (Ehrhart 1983). The West Indian manatee frequents the coastal waters of Brevard County, including the Indian River, in all seasons. Approximately 150 manatees use the Brevard County coastal waters in the summer and about 120 in winter (Florida Natural Areas Inventory 1990). It would not be unusual to observe Bald eagles perched along the Indian River or foraging over the area, since a number of nests are located in Brevard County.

Table 4-2. Status of State and Federally Listed Wildlife that May Occur at BV-2C Proposed Dredged Material Disposal Site, Proposed Pipeline Access or Adjacent Waters, Brevard County, Florida (Page 1 of 3)

Species	Status			Occurrence
	State	FCREPA	Federal	
AMPHIBIANS AND REPTILES				
Caretta caretta Atlantic loggerhead	T	T	T,I	OV
Chelonia mydas Atlantic green turtle	E	E	E,I	OV
Dermochelys coriacea Atlantic leatherback	E	R	E,I	OV
Lepidochelys kempi Atlantic ridley turtle	E	E	E,I	OV
BIRDS				
Accipiter cooperii Cooper's hawk		SSC		OV
Casmerodius albus Great egret		SSC		OV
Charadrius melodus Piping plover	T	SSC	T	OV
Circus cyaneus Northern harrier			II	OV
Egretta caerulea Little blue heron	SSC	SSC		OV
Egretta thula Snowy egret	SSC	SSC		OV
Egretta tricolor Tricolored heron	SSC	SSC		OV
Eudocimus albus White ibis		SSC		OV

Table 4-2. Status of State and Federally Listed Wildlife that May Occur at BV-2C Proposed Dredged Material Disposal Site, Proposed Pipeline Access or Adjacent Waters, Brevard County, Florida (Page 2 of 3)

Species	Status			Occurrence
	State	FCREPA	Federal	
Falco columbarius Merlin			II	OV
Falco peregrinus Peregrine falcon	E	E	T,I	OV
Falco sparverius paulus Southeastern kestrel	T	T	C	OV
Falco sparverius sparverius American kestrel			II	OV
Haliaeetus leucocephalus Bald eagle	T	T	E,I	OV
Mycteria americana Wood stork	E		E	OV
Nyctanassa violacea Yellow-crowned night heron		SSC		OV
Nycticorax nycticorax Black-crowned night heron		SSC		OV
Pandion haliaetus Osprey		T	II	RS
Pelecanus occidentalis Brown pelican	SSC	T		OV
Plegadis falcinellus Glossy ibis		SSC		
Sterna antillarum Least tern	T	T		OV
Sterna caspia Caspian tern		SSC		OV

Table 4-2. Status of State and Federally Listed Wildlife that May Occur at BV-2C Proposed Dredged Material Disposal Site, Proposed Pipeline Access or Adjacent Waters, Brevard County, Florida
(Page 3 of 3)

Species	Status			Occurrence
	State	FCREPA	Federal	
Sterna maxima Royal tern		SSC		OV
Sterna sandvicensis Sandwich tern		SSC		OV
MAMMALS				
Mustela frenata peninsulae Florida long-tailed weasel		R	C	PR
Trichechus manatus West Indian manatee	E	T	E,I	OV

Federal: U.S. Fish and Wildlife Service; E = Endangered; T = Threatened; C = Candidate for listing, with same evidence of vulnerability but for which not enough data exists to support listing. Convention on International Trade in Endangered Species of Wild Fauna and Floras; I = Appendix I Species; II = Apendix II Species.

State: Florida Game and Fresh Water Fish Commission; E = Endangered; T = Threatened; SSC = Species of Special Concern.

FCREPA: Florida Committee on Rare and Endangered Plants and Animals (unofficial); E = Endangered; T = Threatened; SSC = Species of Special Concern; R = Rare.

Occurrence Code: RS = Known resident (based on WAR observations, other trained observers, museum specimens or accepted scientific papers) PR = Probable resident (suitable habitat occurs on site and is within known or probable distribution range of species) OV = Occasional visitor (migrants, accidentals, or may be within part of home range of this species)

Source: FGFWFC 1991.
WAR 1991.

A number of wading and aquatic birds use the Indian River for foraging. The Indian River and the emergent wetlands provide abundant fish and shellfish resources to support populations of coastal and wading birds. In addition rookeries are known to exist in the county, although none are in the vicinity of the site or the pipeline access route.

5.0 PIPELINE EASEMENT

5.0 PIPELINE EASEMENT

The pipeline easement extends from just north of the easterly terminus of Aurantia Road near the southeastern corner of the site, east to the Indian River. The easement is 60 feet wide and traverses approximately 600 feet before intercepting the mean high water line of the Indian River. The easement passes through wetlands along mosquito ditches west of the railroad grade, through a culvert at the railroad grade and over the fringing marsh of the Indian River. Although the flooded mosquito ditch receives tidal waters through the culvert, freshwater species were prevalent at the culvert at the time of the site visit. The species observed at the culvert include sea ox-eye, water hyacinth and torpedo grass. The saltmarsh adjacent to the Indian River is vegetated with sea ox-eye, perennial glasswort and saltwort. Thin bands of saltmarsh cordgrass bordered the Indian River and the small creeks entering the marsh. Within the fringing saltmarsh there are numerous small excavated ponds. Some of these shallow ponds are vegetated with submerged seagrass.

The Indian River lagoon also contains bands of submerged sea grasses just east of the terminus of the pipeline easement (Brevard County 1986). This source indicates seagrass extending out to 2,300 feet from shore with coverage from 10 to 70 percent. Beyond this band, sparse seagrass areas occur nearly throughout the Indian River lagoon north of the ICWW channel. Shallow zones (less than 60 cm) are typically vegetated with dense (40 to 70 percent coverage) shoal grass (Halodule wrightii) and widgeon grass (Ruppia maritima). Usually manatee grass (Cymodocea filiformis) is the dominant submerged vegetation beyond the shoal grass zone. Halophila engelmannii is normally the dominant cover in deeper areas of the Indian River in this region. as distance and depth from shore increase, density of seagrass cover decreases.

6.0 JURISDICTIONAL WETLANDS

6.0 JURISDICTIONAL WETLANDS

All of the wetlands on site are considered jurisdictional by the U.S. Army Corps of Engineers. The herbaceous wetland (640) in the south central part of the site as well as the freshwater marsh (641) and shrub marsh/freshwater marsh composite (618/641) in the northeastern quadrant of the site are isolated wetland systems and subject to the St. Johns Water Management District (SJWMD) permitting requirements. In addition, some of the ditches in the fallow field areas do not connect with State waters; therefore, these would be reviewed by SJWMD. Although most of the ditches connect to waters of the state, an exemption regarding small ditches dug through uplands should apply which would allow severance of these connections, thereby creating isolated wetlands that would then be subject to SJWMD permitting.

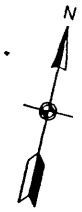
The remaining wetlands connect to waters of the State and, therefore, come under review by the Florida Department of Environmental Regulation (DER). These wetlands include the shrub marsh/saltwater marsh community (618/642), the brackish marsh community (641/642), the mixed hardwood/wetland hardwood forest community (438/610), the saltmarsh community (642) and associated mosquito ditches. The freshwater marsh community located south of a drainage ditch and nearly surrounded by the wetland hardwood community would also be subject to DER review.

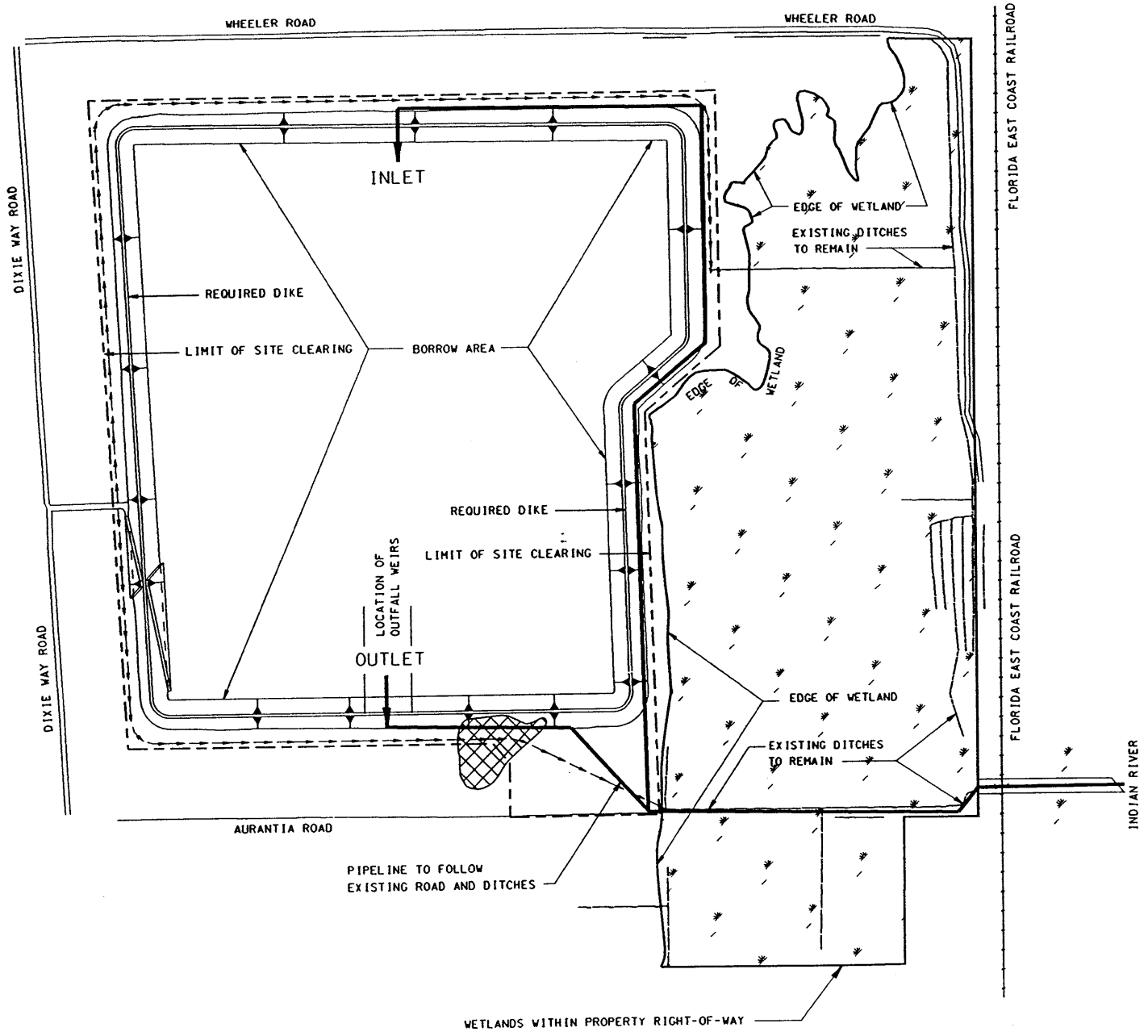
LEGEND

CONTIGUOUS WETLANDS

ISOLATED WETLANDS

PIPELINE ROUTE





US Army Corps of Engineers
JACKSONVILLE DISTRICT

DISPOSAL AREA BV-2C
WETLANDS MAP

CESAJ-EN-DL

DATE:

SHEET NO.: 2 of 5

7.0 REFERENCES

7.0 REFERENCES

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Water and Air Research, Inc.
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APPENDIX II

ENGINEERING NARRATIVE AND PERMIT DRAWINGS

Engineering Narrative

BV-2C Disposal Area

This narrative summarizes the documents comprising the dredge and fill permit application package for the development of Dredged Material Management Area BV-2C. The BV-2C facility will provide a continuing material management capability to service the maintenance requirements of Reach I of the Intracoastal Waterway (ICWW) in Brevard County, Florida. This reach extends 7.74 miles from a point 2.6 miles south of the Brevard-Volusia county line (ICWW mile 126.33) to the vicinity of Mims (ICWW mile 134.07).

The submission of this application package represents an intermediate step towards the completion of the second phase of a two phased program element addressing the maintenance requirements of the Intracoastal Waterway in Brevard County, Florida. This element is part of a fifteen year program sponsored by the Florida Inland Navigation District to develop a long-term dredged material management plan for the Intracoastal Waterway along the entire east coast of Florida. Phase I of the Brevard County program element, which is documented in four reports included as Attachments 1 through 4 to this permit application, developed basic plan concepts for the continuing management of maintenance material dredged from the ntracoastal Waterway in Brevard County, defined short and long term program needs based on a comprehensive examination of historical dredging records for the project area, and identified suitable centralized sites which satisfy these needs based on preliminary environmental, engineering, and operational criteria. Phase II consists of the gathering of detailed, site specific information required for the preparation and submission of permit applications for the primary material management areas identified in Phase I. In addition, Phase II also addresses the preliminary design of the site containment facilities; the acquisition of these sites (where appropriate), through negotiated purchase or condemnation, by the Florida Inland Navigation District; and the construction and continuing operation and maintenance of these sites to a provide permanent material management capability for the Intracoastal Waterway in Brevard County, Florida.

No attempt is made in this narrative to recount, in detail, the information contained in the documents which accompany the permit application. Rather, this narrative is designed to assist the reviewer in organizing this information, while emphasizing the engineering considerations and design specifications presented in the attached permit drawings (Attachment 5). In addition to the permit drawings and the Phase I reports already mentioned, the permit application package for the BV-2C dredged material management ea includes: Attachment 6, boundary and easement surveys for the site, providing completeness, as well

as the legal description necessary for acquisition; Attachment 7, a topographic survey, documenting pre-construction topography and drainage patterns, and providing information necessary for site design, volumetric calculations, and grade analysis; Attachment 8, a sub-surface and soils report, identifying site foundation conditions and in-situ construction material suitability, as well as locating the water table on-site; Attachment 9, an environmental report, documenting existing environmental conditions, including vegetation communities and wildlife habitats, and serving to guide the configuration of the containment area within the site so as to avoid, to the greatest extent possible, the most sensitive environmental areas; and Attachment 10, a site specific management plan, ensuring that the containment area will continue to be operated in an efficient manner as a permanent facility with adjacent off-site land use.

The BV-2C material management area comprises 311.39 acres located approximately five miles north of Mims. It lies approximately 600 feet west of the Indian River (Attachment 5, Sheet 1 of 4). It is bounded on the west by Dixie Way, on the north by Wheeler Road, and on the east by the Florida East Coast Railroad (FECRR) right of way. Lands to the north, south, and west of the site contain a mixture of citrus groves and fallow croplands. Sparse rural residential development is also present in these areas. Soils on the site consist predominantly of poorly drained varieties including, Bradenton fine, Felda, Immokalee, Myakka, Wabasso, Valkaria, and Pompano sands. Also occurring in wetland areas on site are a variety of very poorly drained soils including Chobee loamy sand, Anclote sand, Copeland complex, and Tidal marsh. No historical or archaeological sites are recorded for this property, in the Florida Master Site File maintained by the Florida Department of State.

Based on an analysis of historical dredging requirements and recent shoaling presented in the Phase I (plan development) report for Brevard County (Attachment 1), the projected 50-year disposal requirement for Reach I is 3,162,180 cubic yards (cy). The BV-2C facility is designed to meet this requirement.

Detailed environmental information for the BV-2C material management area is provided in the attached environmental report (Attachment 9). Making use of the Florida Land Use forms and cover classification system, site vegetation consists mainly of active citrus groves (221), fallow croplands (261), and herbaceous rangeland (310). Notable features include three areas of isolated wetlands totalling 8.9 acres (Attachment 5, Sheet 4 of 4). These wetlands are subject to the permitting review of the U.S. Army Corps of Engineers and the St. Johns Water Management District. Also on site are 69.2 acres of wetlands that are connected to the waters of the state and are therefore subject to the permitting authority of the Florida Department of Environmental Regulation (DER). In addition, numerous small ditches are located in fallow

field areas located on the property. Although most of these connect to state waters, their connection points are quite small in cross sectional area and therefore may be exempt from permitting review under DER guidelines. However, they would remain subject to regulation by the U.S. Army Corps of Engineers and the St. Johns Water Management District.

Construction of the BV-2C facility will be carried out in two phases. The first phase will include the clearing of all vegetation within the containment area and fence line, the installation of a security fence around the site perimeter, and the construction of an on-site access road. This phase will be completed as soon as practical following site acquisition. The second phase of site preparation will consist of the construction of the containment basin, and the installation of the outlet structures and other design features. This phase of site preparation is subject to the scheduling and budget priorities of the Jacksonville District Corps of Engineers and therefore may not immediately follow the completion of the initial site clearing and fencing. However, the site will be secured by a fence and security procedures will be in place prior to the commencement of excavation, grading, and dike construction. Each element of site preparation and construction is discussed in detail in the site management plan (Attachment 10).

The total acreage of BV-2C is 311.39 acres. Of this, approximately 142 acres will be preserved as a buffer area surrounding the containment basin. The north, west and south buffer areas will be 300 feet in width (Attachment 5, Sheet 2 of 4). It is anticipated that citrus production will continue in these areas under lease agreement between FIND and local citrus growers. The eastern buffer will vary in width from 500 to 1,400 feet and will encompass the DER jurisdictional wetlands previously described. Therefore, these wetlands will not be impacted by containment basin construction.

To obtain the required dredged material storage capacity within the BV-2C containment basin of 159.68 acres, it will be necessary to construct dikes to a crest elevation of 17.0 feet (+21.90 ft NGVD) above the existing mean site elevation of +4.90 ft NGVD (Attachment 5, Sheet 3 of 4). The material to construct the dikes will be obtained by excavating the containment basin interior, and from the construction of perimeter ditches. Based on a conservative dike cross-section design including side slopes of 1V:3H and a dike crest width of 12 feet, 440,196 cy of material will be required. An additional 3,618 cy will be required for ramps to provide equipment access to the interior of the containment basin. The basin interior will be excavated to a mean elevation of +2.90 ft NGVD, or 2.0 feet below the existing site grade. Excavation will be set back 20 feet from the inside toe of the dikes, maintaining the same 1V:3H side slope. When the containment basin is filled to its capacity of 3,241,188 cy, the surface of the deposition layer will

be a minimum of 4.0 feet below the dike crest, thereby providing the required 2.0 feet of freeboard and 2.0 feet of ponding depth.

The dredged material will be pumped as a slurry to the material management area via a pipeline. Each dredging operation will require the placement and retrieval of both supply and return pipelines. The location of the pipeline routes is shown in Attachment 5, Sheet 2 of 4. The pipelines will be placed within a 60 foot wide easement which extends approximately 600 feet from the ICWW to the eastern site boundary, where it adjoins the site near the southeastern property corner. Within the site boundary, the inlet pipeline will be routed along the southern and western sides of the containment dike, entering the basin near its northwest corner by passing over the dike crest (Attachment 5, Sheet 2 of 4).

Decanting of the ponded water will be accomplished by a parallel arrangement of four corrugated metal half-pipes, located in the southeast corner of the containment area, diagonally opposite the slurry inlet (Attachment 5 Sheet 2 of 4). Each half-pipe will provide for the release of effluent over a sharp-crested weir section of a minimum length of 9 feet, for a total minimum crest length of 36 feet. The weir crest height will be adjustable by means of removable flash boards. The range of adjustment will extend from a minimum elevation of +1.45 ft NGVD, the excavated basin interior grade in the vicinity of the weirs, to a maximum elevation of +19.40 ft NGVD, or 16.5 feet above the mean excavated grade. The minimum weir crest elevation facilitates the control of stormwater runoff prior to disposal operations, while the maximum elevation facilitates control of the final elevation of the deposition layer surface. The four weirs are to be connected by a manifold, with a single outlet pipe passing under the dike. Following the easement described above, the outlet pipeline will return the supernatant to the Indian River.

As stated above, the minimum length of the weir crest for the BV-2C containment basin is 36 feet. This specification is derived from results obtained from the Selective Withdrawal Model developed by the U.S. Army Corps of Engineers' Waterways Experiment Station (WES), and represents the weir crest length required to maintain the depth of withdrawal less than the minimum ponding depth of 2.0 feet. For this and all succeeding calculations, it has been assumed that an 24 inch O.D. dredge, (discharge velocity of 16 ft/sec, a volumetric discharge of 6,430 c.y./hr, and a 20/80 solids/liquid slurry mix) will be used for future channel maintenance. However, the physical constraints of the channel will most likely dictate the use of a 16 to 18 inch O.D. dredge. Thus, the design of the containment basin is considered to be conservative and easily capable of meeting performance standards. Analysis of weir performance based on nomograms developed at the COE Waterways Experiment Station (WES) under the Dredged Material Research Program

(DMRP) (Walski and Schroeder, 1978) indicates that these design parameters may be expected to produce an effluent suspended solids concentration of 0.63 g/l, assuming a minimum average ponding depth of 2 feet. Translation of suspended solids concentration to a measure of turbidity on which Florida water quality standards are based is highly dependent on the suspended material characteristics. However, WES guidelines (Palermo, 1978) indicate that the above stated effluent quality will satisfy these standards. Should effluent quality deteriorate below the ambient conditions of the receiving waters, steps shall be taken to decrease effluent turbidity. These include intermittent dredge operation, increased ponding depth, or the use of turbidity curtains surrounding the basin outlet weirs.

The BV-2C material management area is located adjacent to a public roadway (Dixie Way), therefore a separate ingress-egress easement will not be required. Road access to the site will be provided via a driveway connection to Dixie Way at a point near the southwestern site corner (Attachment 5, Sheet 2 of 3).

A system of perimeter ditches will be constructed at a 20 foot setback from the outside toe of the containment dike to control stormwater runoff from the exterior face of the containment dike, perimeter road, and portions of the buffer area. These ditches will also provide a means for intercepting any horizontal migration of saltwater from the interior of the containment area. Preliminary analysis indicates that at a minimum depth of 2.0 feet, the ditches will provide adequate conveyance for the 25 year storm runoff.

Finally, an analysis of containment area efficiency was performed to determine the minimum operational ponding depth required for adequate solids retention performance and acceptable effluent quality. The projected performance of the basin is highly dependent on the physical characteristics of the sediment to be dredged. The characteristics of the sediment to be dredged within Reach I were derived from the findings of a county-wide study of Indian River sediments conducted by Trefry et al. (1990). The data presented in this study were analyzed with respect to the most recent ICWW channel survey data (1987). From this analysis it was determined that 23.3 percent of the in-place volume of shoal sediments within Reach I is made up of fine material, that is, sediments less than 0.074 mm grain size diameter. Organics, which represent a small component of the fines, make up only 3.4 percent of the total shoal volume. However, the Trefry report also indicates that some areas of the ICWW channel within Reach I contain deposits of fine-grained sediments in excess of 30 cm. Dredging these areas could result in short periods during which the sediments entering the containment basin contain up to 60 percent fines. Therefore, to

ensure that the containment basin is able to meet or exceed all effluent discharge and water quality criteria, as design is based on the "worst-case" assumption that the dredged material contains 60 percent fines. Based on this conservative design criterion, an associated zone settling velocity was then determined from an empirical relationship between the percentage of fine-grained material and settling behavior. This settling velocity was then used to determine the retention time needed to provide adequate basin performance.

Retention time is directly related to the depth of ponded water maintained within the basin. The preliminary design of the containment basin provides for a minimum 2.0 foot ponding depth. That is, at capacity the containment dike will retain 2.0 feet of ponding plus 2.0 feet of freeboard above the maximum deposition surface. Analysis of the hydraulic characteristics of the proposed containment area indicates that a 2.0 foot ponding depth will provide a maximum retention time of 82.41 hours during the period in which the flow over the weir balances the liquid discharge of the dredge. In comparison, the time required for the suspended sediment to settle out of the withdrawal depth of 2.0 feet is 3.34 hours, based on the zone settling velocity derived above. Research by the U.S. Army Waterways Experiment Station (WES) under the Dredged Material Research Program (DMRP) (Shields et al., 1987) indicates that to account for field conditions, the required settling time of the dredged material should be multiplied by a factor of 2.25. Thus, the calculated maximum retention time of 82.41 hours provided by a 2 foot ponding depth greatly exceeds the adjusted required settling time of 7.52. Therefore, a 2.0 foot minimum ponding depth for the BV-2C containment basin will provide adequate retention to maintain the required effluent quality. However, ponding depths should be maintained above the 2.0 foot minimum whenever possible. The recommended operational ponding depth for Site BV-2C is 4.0 feet, with a maximum of 5.0 feet. The use of a 4.0 foot operational ponding depth results in a basin retention time of 164.8 hours, thereby providing an additional margin of safety, and ensuring that the clarified supernatant released from the BV-2C containment basin will meet state water quality standards.

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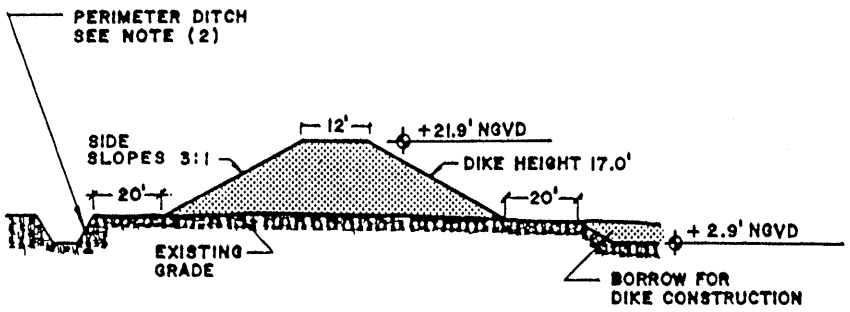
Palermo, M.R., R.L. Montgomery, and M.E. Poindexter, "Guidelines for Designing, Operating, and Managing Dredged Material Containment Areas",Technical Report DS-78-10, Dec. 1978, U.S. Army Engineer Waterways Experiment Station, CE, Vicksburg, MS.

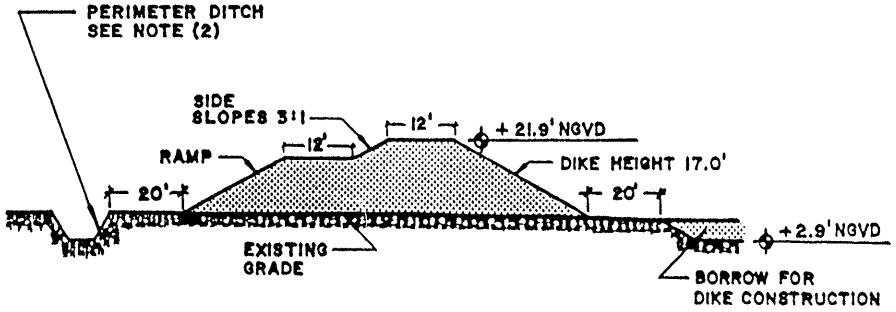
Shields, F.D., Jr. E.L. Thackston, and P.R. Schroeder, "Design and Management of Dredged Material Containment Areas to Improve Hydraulic Performance", Technical Report D-87-2, June 1987, U.S. Army Corps of Engineers Waterways Experiment Station, CE, Vicksburg, Mississippi.

Trefrey, J.H., S. Metz, R.P. Trocine, N. Iricanin, D. Burnside, N.C. Chen, and B. Webb, "Design and Operation of a Muck Sediment Survey", Technical Report SJ30-SP3, April, 1990, Department of Oceanography and Ocean Engineering, Florida Institute of Technology, Melbourne, FL.

Walski, T.M. and P.R. Schroeder, "Weir Design to Maintain Effluent Quality from Dredged Material Containment Areas", Technical Report D-78-18, May 1978, U.S. Army Engineer Waterways Experiment Station, CE, Vicksburg, MS.



SECTION A-A'
N.T.S.



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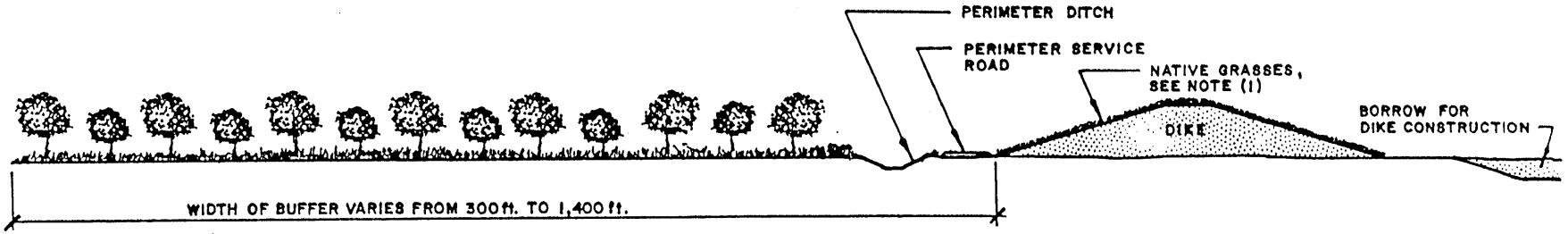

DISPOSAL AREA - VEGETATION PLAN
N.T.S

NOTES:
1. TYPICAL SPECIES INCLUDE:
   PASPALUM VAGINATUM
   SPARTINA PATENS
   SPOROBOLUS SPECIES
2. PERIMETER DITCH:
   SIDE SLOPE: 3:1
   BOTTOM WIDTH: 3ft.
   MEAN INVERT ELEV.: 2 ft.
   BOTTOM SLOPE AS REQUIRED
   FOR DRAINAGE

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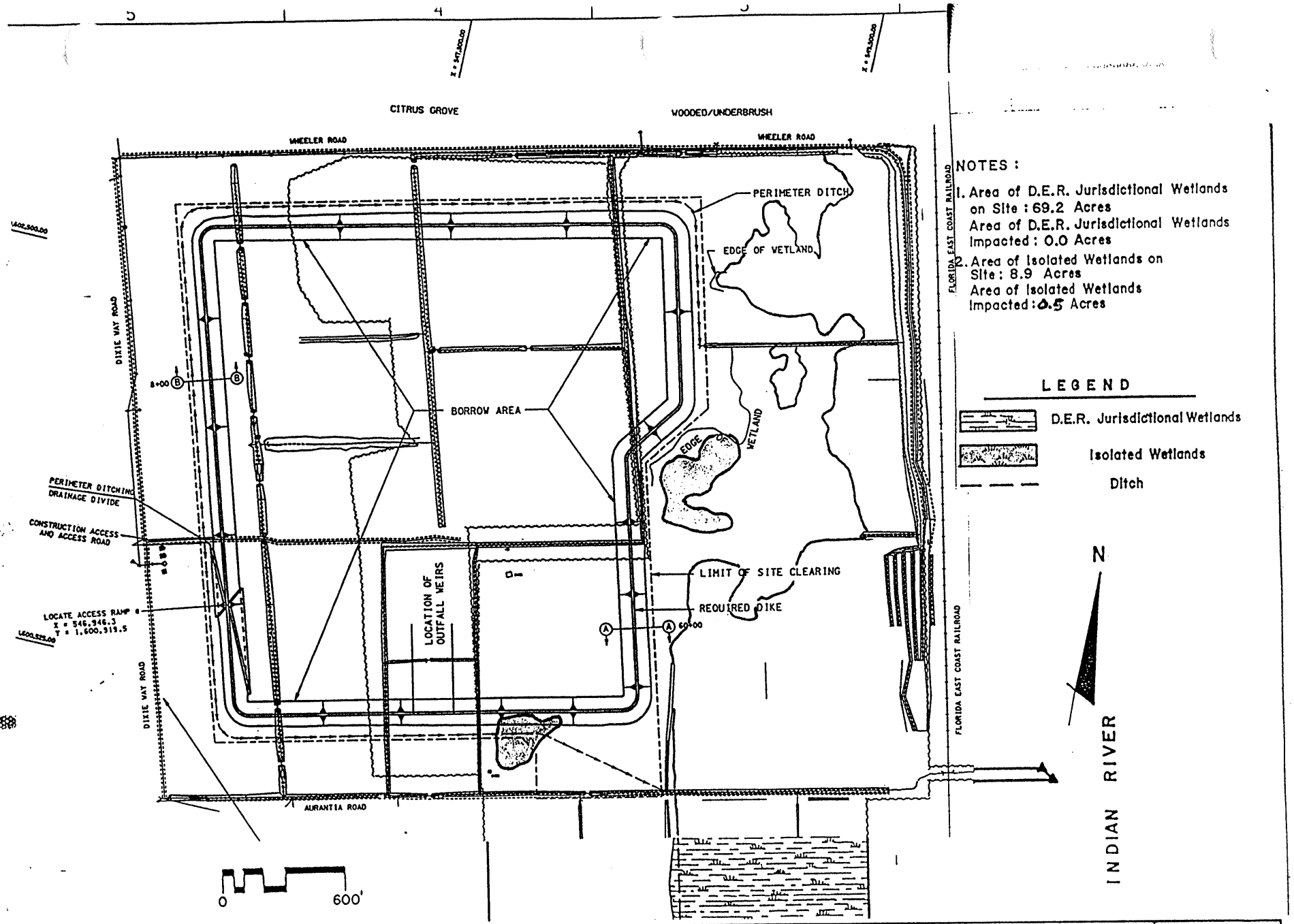
JACKSONVILLE, FLORIDA 32256

Typical Dike and Ramp Sections, Vegetation Plan
Site BV-2C
Brevard County, Florida

PROJECT	C-9004
REVISION	
SHEET	3 of 4
DATE	Aug., 1992



NOTES :

1. Area of D.E.R. Jurisdictional Wetlands on Site : 69.2 Acres
   Area of D.E.R. Jurisdictional Wetlands Impacted : 0.0 Acres
2. Area of Isolated Wetlands on Site : 8.9 Acres
   Area of Isolated Wetlands Impacted : 0.5 Acres

LEGEND

- D.E.R. Jurisdictional Wetlands
- Isolated Wetlands
- Ditch

TAYLOR ENGINEERING, INC
Revised by: U.S. Army Corps of Engineers
Jacksonville District

Wetlands Map
BV-2C Dredged Material Management Area,
Brevard County, Florida

PROJECT	C-9004
REVISION	
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DATE	Aug, 1992

Revised Apr, 1996

APPENDIX III

SITE MANAGEMENT PLAN